Agricultural Economics Report No. 236 April 1988

Extent and Impact of Resident Hunter and Angler Expenditures in North Dakota in 1986

James F. Baltezore
Jay A. Leitch

Department of Agricultural Economics
North Dakota Agricultural Experiment Station
North Dakota State University
Fargo, North Dakota

Acknowledgments

The authors would like to thank the resident North Dakota hunters and anglers who responded to our surveys. Our appreciation is extended to the North Dakota Game and Fish Department and the North Dakota Agricultural Experiment Station for financial support.

Thanks is also extended to Carol Jensen who typed the manuscript and to Jim Kinnischtzke, Perry Game, Phil Rooney, Carmen Norskog, Joel Golz, and Philip Leitch who helped with survey mailings and data entry.

The authors also thank Arlen Harmoning, Planner, North Dakota Game and Fish Department, Bismarck, North Dakota, and Theresa Golz, Research Assistant, North Dakota State University, Fargo, for providing technical information.

The authors thank F. Larry Leistritz, Brenda L. Ekstrom, Dean Bangsund, and Timothy A. Petry, Department of Agricultural Economics, North Dakota State University, Fargo, for their constructive comments and suggestions in reviewing the manuscript.

Table of Contents

Table of Contents (Cont)

List of Tables

List of Tables (Cont.)

Appendix Table

Highlights

The purpose of this study was to estimate the extent and impact of resident sportsmen's expenditures in North Dakota in 1986. Special big game hunters had the highest average individual season expenditures, followed by summer anglers and archery antelope hunters. The highest average individual daily expenditures were reported by special big game hunters, followed by firearms antelope and wild turkey hunters.

Sportsmen Activity	*Average Individual Daily Expenditures*	*Average Individual Season Expenditures*
Antelope:		
Firearms	*$499*	*$ 606*
Archery	*$248*	*$1,161*
Deer:		
Firearms	*$211*	*$ 597*
Archery	*$ 70*	*$ 748*
Wild Turkey	*$372*	*$ 489*
Small game:		
Upland game	*$180*	*$ 844*
Waterfowl	*$ 87*	*$ 598*
Furbearer	*N/A*	*$ 646*
Special big game	*$846*	*$1,505*
Fishing:		
Summer	*$127*	*$1,269*
Winter	*$ 33*	*$ 273*

Generally, sportsmen spent less on variable goods and services (food, lodging, and transportation) and more on fixed inputs (vehicles, weapons, and equipment) during the 1986 hunting season than in 1982, when adjusted for inflation. Averages were higher for both total seasonal and daily expenditures.

Resident hunters and anglers spent $310 million in North Dakota in 1986. The real level of hunting and angling expenditures was 14 percent, or $39 million, higher in 1986 than in 1981. This represents a growth of 2.8 percent per year in real terms (adjusted for inflation).

Resident hunters and anglers accounted for $698 million in gross business volume, $149 million in personal income, and 8,470 jobs in North Dakota in 1986. Hunters and anglers generated 3 percent of the gross state product, 2 percent of the state's personal income, and 3 percent of the state's employment.

EXTENT AND IMPACT OF RESIDENT HUNTER AND ANGLER EXPENDITURES IN NORTH DAKOTA IN 1986

James F. Baltezore and Jay A. Leitch*

Introduction

Fish and wildlife are important North Dakota natural resources that provide ecological, recreational, and economic benefits. Hunters and anglers spend millions of dollars annually on goods and services related to hunting and fishing activities. Managing game and fish resources effectively requires accurate and regular information on expenditures by sportsmen within the state. Comparing expenditures from previous years provides important information on changes in expenditure patterns over time. Information on the size, distribution, and variability of expenditures is useful in preparing and justifying departmental budgets and activities.

North Dakota's licensed hunters and anglers have an impact on the state's economy. Leitch (1984) reported licensed resident hunters and anglers spent $225 million in the state in 1981 ($271 million when adjusted for inflation to reflect 1986 dollars). Anderson and Leitch (1984) reported that nonresident hunters and anglers spent $13 million in the state in 1983 ($14 million when adjusted for inflation to reflect 1986 dollars).

The purpose of this study[1] was to estimate the extent and impact of resident hunter and angler expenditures in North Dakota during the 1986-87 season.[2] Expenditures by resident sportsmen provide the primary data base for empirical analyses of their behavior. Expenditures are used in developing analytical models of outdoor recreation demand and in estimating their impact on the state's economy.

---

[1]A complete, detailed study report including survey instruments is presented in Baltezore and Leitch 1987.

[2]Resident hunters and anglers were previously surveyed in 1981 (Leitch and Kerestes 1982) and in 1982 (Kerestes and Leitch 1983b). Nonresident hunters were surveyed in 1976 (Leitch and Scott 1978) and anglers and hunters in 1983 (Anderson and Leitch 1984). Data collected in 1986-87 will provide a second point in developing a time-series data set. This will lead to planned collection again in 1990, concurrent with the 1990 National Survey by the U.S. Fish and Wildlife Service (U.S. Department of the Interior, Fish and Wildlife Service 1982). Subsequent collection at five-year intervals could be conducted thereafter, concurrent with the National Survey.

*Baltezore is research assistant and Leitch is associate professor, Department of Agricultural Economics, North Dakota State University, Fargo.

Procedures

Primary data were collected through mail surveys of licensed sportsmen for hunting and fishing activities shown in Table 1. Names and addresses for survey sample groups were supplied by the North Dakota Game and Fish Department from hunting and fishing license records.

TABLE 1. LICENSES ISSUED AND SURVEY SAMPLE SIZES BY LICENSE TYPE, 1986

License Type	Licenses Issued			Mail Survey Sample Size[c]	Desired Response[d]
	Gratis[a]	Resident	Total[b]		
Firearms antelope	305	325	630	630	525
Archery antelope	N/A	732	732	735	600
Firearms deer[e]	10,671	75,000	85,671	1,971	1,500
Archery deer	N/A	10,735	10,735	1,829	1,000
Wild Turkey					
Early	N/A	751	751	751	250
Late	204	1,171	1,375	1,354	400
Fishing					
Summer	N/A	143,751	143,751	2,500	500
Winter	N/A	N/A	N/A	612	225
Small game	N/A	65,987	65,987	2,000	750
Furbearer	N/A	34,781	34,781	5,728	1,500
Special big game					
Bighorn sheep	N/A	7	7	7	7
Elk	5	35	40	40	40
Moose	N/A	105	105	105	105

[a]Landowner hunters are given a gratis license at no charge provided they either own or lease a minimum of a quarter section of land.
[b]Total includes both gratis licenses issued and resident licenses sold.
[c]Number mailed in initial mailing.
[d]Number needed was derived using variability estimates of total seasonal expenditures from Leitch and Kerestes (1982) and Kerestes and Leitch (1983b), adjusted for potential nonresponse.
[e]First season only, November 7-30, 1986.

Licenses limited in number (e.g., firearms deer and antelope, special big game, and turkey) are issued through lotteries to people who apply directly to the Game and Fish central office. Names and addresses of purchasers are available to be used for surveys. Archery deer and antelope, small game, furbearer, and fishing licenses are sold by vendors throughout the state with no limit on the number sold. The time required to collect license information from vendors across the state prohibits using current-year license buyers for surveys. Therefore, vendor license samples were selected from the 1985 license-buying population.

Sample sizes for mail surveys were determined using variability estimates of daily and seasonal variable expenditures from Leitch and Kerestes (1982) and Kerestes and Leitch (1983b), adjusted upward for potential nonresponse. Insight gained from previous studies was used to determine sampling methods, consequences of error, and design considerations (Kerestes and Leitch 1983a). (Future sample sizes for surveys based upon data from this study are presented in Appendix A.)

Information collected on expenditures and other characteristics of North Dakota resident sportsmen was summarized for the 1986 season. Confidence intervals were estimated for seasonal and daily variable, fixed, and total expenditures. Total seasonal and daily expenditures from the 1986 season were compared with 1982 expenditures using a Z test to test for significant differences at a 90 percent significance level (alpha = 0.1).

Expenditures for the 1982 season were indexed to 1986 dollars to adjust for inflation. Expenditures in 1982 were increased by 13 percent to reflect changes in the general price level (inflation) from 1982 to 1986 (U.S. Department of Commerce 1986). Any significant differences remaining between 1982 and 1986 expenditures would be a result of factors other than inflation. If significant differences existed between the years for seasonal and/or daily expenditures, further analysis was done to identify factors responsible for the changes detected.

Reported expenditures from 1982 were used because in most activities there was no real difference between 1981 and 1982 resident expenditure patterns. Exceptions were upland game, archery deer, and archery and firearms antelope. Differences in expenditures by upland game hunters were due to changes in the survey instrument. In 1981, expenses were itemized, while in 1982 they were not. Archery deer expenditures were different because an allocation format was used for fixed expenses in 1981 while actual expenses were used in 1982. No archery or firearms antelope hunting seasons were held in 1981.

Projected total expenditures by all resident hunters or anglers for each activity were estimated by projecting the average expenditures of licensees responding to the estimated total number of residents who participated. Total questionnaires returned, less wrong addresses, no responses, and respondents who did not buy a license for each activity, represents the actual sample size used in projecting expenditures for the entire population. The number of respondents who participated was divided by the actual sample size and then multiplied by the number of licenses

issued to estimate the number of active sportsmen in the population. The number of active sportsmen was multiplied by average variable and fixed seasonal expenditures to estimate total variable and fixed expenditures by all hunters or anglers for the particular sportsmen activity. Total variable and fixed expenditures were summed to estimate the total projected expenditure for that activity within North Dakota.

North Dakota Input-Output Model

The North Dakota Input-Output (I-O) Model is a research tool used to analyze the economic base of North Dakota and to project economic growth of the state. The I-O Model groups the state's economy into 17 industrial sectors. Economic sectors and corresponding Standard Industrial Classifications (SIC) are presented in Table 2. These groupings were used to categorize expenditures and identify basic economic sectors. (For a detailed description of the I-O Model, see Coon et al. 1985.)

Expenditures by hunters and anglers can be divided into two general categories: variable goods and services, and fixed inputs (Table 3). Variable goods and services are consumed or used over a short time period or can only be used once. Their cost is directly related to the level of activity. Fixed inputs last longer and may be used more than once. Generally, sportsmen expenditures on variable goods and services support the business and personal services sector (Sector 10) while expenditures on fixed inputs support businesses in the retail trade sector (Sector 8).

Itemized expenditure categories were aggregated into appropriate sector delineations corresponding to those in the North Dakota Input-Output Model (Coon et al. 1985; Coon and Leistritz 1987), allowing for estimation of the economic and employment impacts of hunter and angler expenditures on the North Dakota economy.

Results

Firearms Antelope

The North Dakota Game and Fish Department supplied names and addresses of 630 resident North Dakota firearms antelope hunters from the 1986 hunting season. Each licensee was mailed a postseason questionnaire. Of the 630 questionnaires mailed, 501 were returned after three mailings for a 79 percent survey response rate.

Characteristics

Characteristics of resident firearms antelope hunters and a subset of resident hunters, gratis hunters, were analyzed both as a group and separately. Landowner hunters are given a gratis (no charge) license provided they either own or lease a minimum of a quarter section of land. They can hunt only on their own land with a gratis license.

TABLE 2. ECONOMIC SECTORS AND ASSOCIATED STANDARD INDUSTRIAL CLASSIFICATION (SIC) CODES FOR THE NORTH DAKOTA INPUT-OUTPUT MODEL

Economic Sector	SIC Code
1. Agriculture, Livestock	Major Group 02 - Agricultural Production, Livestock
2. Agriculture, Crops	Major Group 01 - Agricultural Production, Crops
3. Nonmetallic Mining	Major Group 14 - Mining and Quarrying of Nonmetallic Minerals, Except Fuels
4. Contract Construction	Major Groups 15, 16, 17 - Contract Construction
5. Transportation	Major Groups 40, 41, 42, 43, 44, 45, 46, and 47 - Transportation
6. Communications and Utilities	Major Group 48 - Communication, and Major Group 49 - Electric, Gas, and Sanitary Services, Except Industry No. 4911
7. Agricultural Processing and Miscellaneous Manufacturing	Major Groups 50 and 51 - Wholesale Trade, Major Group 20 - Food and Kindred Products Manufacturing
8. Retail Trade	Major Groups 52, 53, 54, 55, 56, 57, 58, and 59 - Retail Trade
9. Finance, Insurance, and Real Estate	Major Groups 60, 61, 62, 63, 64, 65, 66, and 67 - Finance, Insurance, and Real Estate
10. Business and Personal Service	Major Groups 70, 72, 73, 75, 76, 78, and 79 - Business and Personal Services
11. Professional and Social Services	Major Groups 80, 81, 82, 83, 84, 86, 88, and 89 - Professional and Social Services
12. Households	Not Applicable
13. Government	Major Groups 91, 92, 93, 94, 95, 96, and 97 - Government
14. Coal Mining	Major Group 12 - Bituminous Coal and Lignite Mining
15. Thermal-Electric Generation	Major Group 491 - Electric Companies and Systems
16. Petroleum and Natural Gas Exploration and Extraction	Major Group 13 - Crude Petroleum and Natural Gas
17. Petroleum Refining	Major Group 29 - Petroleum Refining and Related Industries

TABLE 3. RESIDENT HUNTER AND ANGLER EXPENDITURE CATEGORIES

Expenditure Category	
Variable Goods and Services	
Food and beverages	Film and film developing
Lodging	Taxidermy
Transportation	Live bait
Ammunition	Rentals
Access fees	Boat operating expenses
Meat processing	Veterinarian
	Other variable expenditures
Fixed Inputs	
Arrows	Traps
Weapons	Skinning equipment
Camping equipment	Boats, motors, and trailers
Clothing	Fishing equipment
Vehicles	Depth finder
Binoculars	All terrain vehicles
Dogs	Winter fishing equipment
Duck boats and decoys	Other fixed inputs

Respondents who were resident firearm hunters traveled considerably farther on average than gratis firearm hunters; however, both groups hunted the same average number of days. The average resident firearms antelope hunter traveled 477 miles, compared to 68 miles for the gratis hunter, and hunted 1.64 days. Overall average traveling distance by the entire group was 366 miles. The majority of hunting (76 percent) and harvesting (79 percent) occurred the first three days of the season (Table 4).

Expenditures

Gratis licensees spent an average of $43.77 on variable goods and services and $512.44 on fixed inputs for an average total seasonal expenditure (variable plus fixed) of $556.20 (Table 5). Resident licensees spent $156.56 on average for variable goods and $468.24 for fixed inputs for an average total seasonal expenditure of $624.80. Average variable, fixed, and total seasonal expenditures by all resident firearms antelope hunters were $124.85, $480.67, and $605.52, respectively. Total projected expenditure by all North Dakota resident firearm antelope hunters was $348,000 for the 1986 hunting season.

Gratis hunters on average spent less on variable goods and more on fixed goods when compared to resident hunters. The average total seasonal expenditure by resident hunters was higher than the average expenditure by gratis hunters.

TABLE 4. REPORTED NUMBER OF FIREARMS ANTELOPE HUNTERS AFIELD AND ANTELOPE HARVESTED BY DAY, 1986

Date	Hunters Afield	Percent Afield	Harvest	Percent Harvested
October 3	300	36.7	150	37.7
October 4	207	25.3	101	25.4
October 5	113	13.8	63	15.8
October 6	25	3.1	13	3.3
October 7	27	3.3	12	3.0
October 8	18	2.2	8	2.0
October 9	16	2.0	6	1.5
October 10	28	3.4	10	2.5
October 11	47	5.7	21	5.3
October 12	37	4.5	14	3.5
Total[a]	818	100.0	398	100.0

[a]Total represents survey responses.

An explanation for differences in expenditures between resident and gratis hunters is that gratis licensees must hunt on their own land. Therefore, expenditures on goods such as access fees, food, lodging, and transportation will be less for gratis hunters than expenditures on the same goods by resident hunters. These differences in expenditure patterns by gratis and resident hunters should not be overlooked when estimating future expenditure patterns of firearms antelope hunters in North Dakota.

The average seasonal variable expenditure in 1986 was significantly less than the average in 1982, declining from $183.75 to $124.85 based on 1986 dollar values (Table 6). The average fixed expenditure was not significantly different even though it increased from $265.22 in 1982 to $480.67 in 1986. The total average expenditure by antelope hunters increased from $467.76 to $605.52, but the increase was not significant due to high variability in expenditures across hunters.

The average variable daily expenditure in 1986 was significantly less; however, the fixed daily expenditure was significantly higher. Average total daily expenditure was not significantly different. This suggests that a smaller daily variable expenditure was offset by a higher daily fixed expenditure.

TABLE 5. FIREARMS ANTELOPE HUNTER EXPENDITURES, 1986

Expenditure Category	License Type		
	Gratis	Resident	All
	dollars		
Variable:			
Access fees	0.00	0.66	0.47
Film	0.25	2.57	1.92
Food and beverages	6.82	29.77	22.78
Lodging	0.00	12.77	9.18
Meat processing	7.80	10.97	10.08
Other	0.04	2.38	1.72
Taxidermy	8.10	44.17	34.03
Transportation	15.77	44.01	35.17
Ammunition	6.61	10.63	9.50
Season	43.77 ± 8.66[a]	156.56 ± 11.60	124.85 ± 9.60
Daily	27.77 ± 6.81	114.13 ± 9.65	89.86 ± 7.86
Fixed:			
Binoculars	3.67	12.28	9.86
Camping equipment	0.09	2.13	1.56
Clothing	2.80	9.93	7.93
Weapons	10.18	28.88	23.62
Miscellaneous	0.58	4.27	3.24
Vehicles	495.09	412.17	434.45
Season	512.44 ± 445.29	468.24 ± 215.59	480.67 ± 198.94
Daily	485.53 ± 442.12	379.91 ± 186.68	409.60 ± 182.63
Total fixed & variable:			
Season	556.20 ± 448.96	624.80 ± 217.14	605.52 ± 200.44
Daily	513.30 ± 446.21	494.04 ± 188.26	499.45 ± 184.67

[a]Indicates a 90 percent confidence interval (alpha = 0.1). There is a 90 percent probability that the true population mean is contained within the confidence interval.

Results suggest that the average firearms antelope hunter in 1986 spent significantly less per day and for the season on variable goods and services and significantly more per day on fixed inputs when compared with 1982. Total average seasonal and daily expenditures by hunters have not increased at a rate greater than inflation. In other words, the 1986 North Dakota hunter did not spend significantly more money to hunt antelope than the 1982 hunter.

TABLE 6. FIREARMS ANTELOPE HUNTING EXPENDITURES BY GRATIS AND RESIDENT HUNTERS FOR 1982 AND 1986 EXPRESSED IN 1986 DOLLARS

Expenditures	1982	1986	Significant Differences[a]
Variable:			
Season	$183.75 ± 10.78[b] (n=467)	$124.85 ± 9.60 (n=402)	Yes
Daily	$118.08 ± 7.84 (n=467)	$ 89.86 ± 7.86 (n=402)	Yes
Fixed:			
Season	$265.22 ± 141.82 (n=339)	$480.67 ± 198.94 (n=402)	No
Daily	$183.46 ± 107.90 (n=339)	$409.60 ± 182.63 (n=402)	Yes
Total:			
Season	$467.76 ± 143.79 (n=336)	$605.52 ± 200.44 (n=402)	No
Daily	$309.87 ± 110.14 (n=336)	$499.45 ± 184.67 (n=402)	No

[a]Significant at a 90 percent confidence level (alpha = 0.1).
[b]There is a 90 percent probability that the true population mean is contained within the confidence interval.

Harvest

Firearms antelope hunters surveyed harvested 398 antelope for an 87 percent success rate (Table 7). The majority of antelope reported harvested were large bucks (284) followed by small bucks (54), large does (48), and small does (12).

TABLE 7. REPORTED ANTELOPE HARVESTED AND FIREARMS ANTELOPE HUNTER SUCCESS RATE, 1986

Item	Number[a]	Percent
Large buck	284	71.3
Small buck	54	13.6
Large doe	48	12.1
Small doe	12	3.0
Total harvested	398	100.0
Total hunters	457	-
Success rate	-	87.1

[a]Number represents survey responses.

Archery Antelope

Resident hunters purchased 732 archery antelope licenses in North Dakota in 1986. Since these names were not available, Game and Fish selected 735 names from 1985 license buyers. Each name was sent a postseason questionnaire. Three mailings yielded 603 responses. Since names from the previous year's license sales were used, a question to determine whether the respondent had purchased a license for the current year should have been included. This question was omitted from the initial mailing, but was included on subsequent mailings. Assuming that all respondents who indicated hunting in 1986 did purchase a license and applying the percentage of nonhunters that did not buy a license from the second and third mailings to all nonhunters, an estimation of the sample that did not buy a 1986 license can be made. Survey response rate was 80 percent.

Characteristics

Archery antelope hunters responding hunted an average of 7.34 days and traveled 688 miles during the hunting season. Antelope archery hunters responding hunted primarily in Billings (19 percent), McKenzie (18 percent), and Bowman counties (15 percent). The average archery antelope hunter responding valued a day of hunting at $45.

Expenditures

North Dakota archery antelope hunters spent an average of $173.67 on variable goods and $987.64 on fixed inputs for an average total seasonal expenditure of $1,160.59 (Table 8). Total projected expenditure by all resident archery antelope hunters was $783,000.

Resident archery antelope hunter spending for variable seasonal goods increased significantly from an average of $133.27 (in 1986 dollars) in 1982 to $173.67 in 1986 (Table 9). Money spent on fixed inputs increased significantly from an average of $431.56 in 1982 to $987.64 in 1986. The total average seasonal expenditure increased significantly from $586.33 to $1,160.59 over the five-year period. Average daily expenditures for variable, fixed, and total goods were not statistically different.

Responding hunters spent significantly more during the 1986 hunting season. However, average daily variable and fixed expenditures have not changed significantly since 1982. This implies that residents hunted more days during the 1986 season and spent similar amounts per day on variable and fixed goods compared to 1982.

Harvest

Reported archery harvest of pronghorn antelope was 52, for a success rate of 20 percent (Table 10). Most of the antelope reported harvested were from McKenzie County (26 percent), followed by Billings (15 percent) and Bowman counties (11 percent).

TABLE 8. ARCHERY ANTELOPE HUNTER EXPENDITURES, 1986

Expenditure Category	Mean
	-----dollars-----
Variable:	
Access fees	0.58
Film	3.46
Food and beverages	42.59
Lodging	7.78
Meat processing	2.27
Other	4.40
Taxidermy	10.37
Transportation	104.80
Season	173.67 ± 19.37[a]
Daily	30.16 ± 3.30
Fixed:	
Arrows	29.53
Binoculars	30.44
Camping equipment	30.24
Clothing	27.88
Weapons	59.40
Miscellaneous	13.67
Vehicles	796.46
Season	987.64 ± 318.67
Daily	218.11 ± 83.08
Total fixed & variable:	
Season	1,160.59 ± 322.68
Daily	248.15 ± 83.43

[a]Indicates a 90 percent confidence interval (alpha = 0.1). There is a 90 percent probability that the true population mean is contained within the confidence interval.

TABLE 9. ARCHERY ANTELOPE HUNTING EXPENDITURES BY RESIDENT HUNTERS FOR 1982 AND 1986 EXPRESSED IN 1986 DOLLARS

Expenditures	1982	1986	Significant Differences[a]
Variable:			
Season	$133.27 ± 12.69[b] (n=283)	$173.67 ± 19.37 (n=242)	Yes
Daily	$ 35.20 ± 4.98 (n=275)	$ 30.16 ± 3.30 (n=239)	No
Fixed:			
Season	$431.56 ± 214.72 (n=190)	$987.64 ± 318.67 (n=243)	Yes
Daily	$146.05 ± 79.26 (n=184)	$218.11 ± 83.08 (n=240)	No
Total:			
Season	$586.33 ± 216.85 (n=190)	$1,160.59 ± 322.68 (n=243)	Yes
Daily	$186.08 ± 80.64 (n=184)	$248.15 ± 83.43 (n=240)	No

[a]Significant at a 90 percent confidence level (alpha = 0.1).
[b]There is a 90 percent probability that the true population mean is contained within the confidence interval.

TABLE 10. REPORTED ANTELOPE HARVESTED AND ARCHERY ANTELOPE HUNTER SUCCESS RATE, 1986

Item	Number[a]	Percent
Large buck	25	48.1
Small buck	17	32.7
Large doe	8	15.4
Small doe	2	3.8
Total harvested	52	100.0
Total hunters	254	-
Success rate	-	20.3

[a]Number represents survey responses.

Firearms Deer

Approximately 75,000 firearms deer licenses were issued in 1986 through a lottery to residents for the first season, November 7-30, 1986. There was a second season in 1986, but since this is not normally the case, the survey was restricted to the first season. A random sample of 1,971 names was provided by the Game and Fish Department. After two mailings, 1,349 questionnaires were returned. Questionnaire returns indicated that 77 respondents did not hunt deer and 1,231 did hunt deer during the 1986 season. Survey response rate was 68 percent.

Characteristics

The average North Dakota firearms deer hunter responding traveled 338 miles and hunted 4.5 days during the season. Preseason scouting was done by 401 respondents, or 33 percent of those who hunted. The average value of a day of deer hunting was $48.

Expenditures

Resident firearms deer hunters spent $122.05 and $474.27 on average for variable and fixed seasonal goods, respectively, for an average total seasonal expenditure of $597.18 per hunter (Table 11). Total projected expenditure by all resident firearms deer hunters was $48,135,000.

Average seasonal variable, fixed, and total expenditures were significantly higher in 1986 than in 1982 (Table 12). The average daily variable expenditure was not significantly different in 1986 than in 1982. Average fixed daily expenditure increased significantly from $64.13 to $171.95 (in 1986 dollars). The average total daily expenditure was also significantly higher in 1986.

Harvest

Resident firearms deer hunters surveyed harvested 977 deer during the hunting season: 829 whitetail deer and 148 mule deer (Table 13). The majority of mule and whitetail deer harvested were large does and antlered bucks. Harvest success rate of residents responding was 79 percent.

TABLE 11. FIREARMS DEER HUNTER EXPENDITURES, 1986

Expenditure Category	Mean
	----dollars----
Variable:	
Access fees	0.28
Film	1.00
Food and beverages	24.03
Lodging	5.47
Meat processing	28.36
Other	6.18
Transportation	45.93
Ammunition	11.92
Season	122.05 ± 5.93[a]
Daily	38.91 ± 2.27
Fixed:	
Binoculars	15.77
Camping equipment	9.73
Clothing	15.45
Weapons	42.42
Miscellaneous	4.20
Vehicles	387.01
Season	474.27 ± 103.19
Daily	171.95 ± 50.23
Total fixed & variable:	
Season	597.18 ± 103.60
Daily	211.16 ± 50.34

[a]Indicates a 90 percent confidence interval (alpha = 0.1). There is a 90 percent probability that the true population mean is contained within the confidence interval.

TABLE 12. FIREARMS DEER HUNTING EXPENDITURES BY RESIDENT HUNTERS FOR 1982 AND 1986 EXPRESSED IN 1986 DOLLARS

Expenditures	1982	1986	Significant Differences[a]
Variable:			
Season	$106.89 ± 5.45[b] (n=811)	$122.05 ± 5.93 (n=1,204)	Yes
Daily	$ 37.98 ± 2.35 (n=804)	$ 38.91 ± 2.27 (n=1,184)	No
Fixed:			
Season	$181.52 ± 63.79 (n=649)	$474.27 ± 103.19 (n=1,202)	Yes
Daily	$ 64.13 ± 30.23 (n=643)	$171.95 ± 50.23 (n=1,182)	Yes
Total:			
Season	$308.31 ± 66.48 (n=628)	$597.18 ± 103.60 (n=1,207)	Yes
Daily	$107.25 ± 31.73 (n=622)	$211.16 ± 50.43 (n=1,186)	Yes

[a]Significant at a 90 percent confidence level (alpha = 0.1).
[b]There is a 90 percent probability that the true population mean is contained within the confidence interval.

TABLE 13. REPORTED DEER HARVESTED AND FIREARMS DEER HUNTER SUCCESS RATE, 1986

Item	Number[a]	Percent
Mule Deer:		
Antlered Buck	51	5.2
Button Buck	17	1.7
Large Doe	58	5.9
Small Doe	22	2.3
Total	148	15.1
Whitetail Deer:		
Antlered Buck	353	36.1
Button Buck	74	7.6
Large Doe	274	28.1
Small Doe	128	13.1
Total	829	84.9
Total harvested	977	100.0
Total hunters	1,231	
Success rate	-	79.4

[a]Number represents survey responses.

Archery Deer

North Dakota residents purchased 10,735 archery deer hunting licenses in 1986. Since these names were not available, Game and Fish selected 1,829 names from 1985 license buyers who were mailed a postseason questionnaire. Questionnaire returns numbered 1,197. Out of those returned, 683 (57 percent) hunted deer. Survey response rate was 63 percent after two mailings.

Characteristics

The average resident archery deer hunter responding traveled 465 miles and hunted 13 days during the 1986 season. Cass County was the most frequently reported hunting unit (9 percent). The average value of a day of deer hunting of those responding was $39.

Expenditures

Resident archery deer hunters spent $141.62 and $597.63 on average for variable and fixed goods, respectively, for an average total expenditure of $748.39 during the hunting season (Table 14). Total projected expenditure by all resident archery deer hunters was $7,040,000.

The average seasonal expenditure on variable goods in 1986 was not significantly different than that in 1982 after adjusting for inflation (Table 15). Fixed and total seasonal expenditures were significantly higher in 1986.

The average daily variable expenditure of respondents was not significantly different; however, expenditures for fixed and total daily expenditures were significantly higher in 1986.

Harvest

Resident archery deer hunters who responded harvested 229 deer during the 1986 hunting season (Table 16). The majority of deer harvested were large bucks followed by large does. Of the 229 harvested, 91 percent were whitetails (Table 16). Hunter success rate was 34 percent. Counties with the highest reported harvest percentages were Stutsman (8.6 percent), Grand Forks (7.7 percent), and McKenzie (7.2 percent).

TABLE 14. ARCHERY DEER HUNTER EXPENDITURES, 1986

Expenditure Category	Mean
	----dollars----
Variable:	
Access fees	0.25
Film	2.21
Food and beverages	33.18
Lodging	3.54
Meat processing	8.02
Other	3.27
Taxidermy	6.05
Transportation	85.10
Season	141.62 ± 16.82[a]
Daily	13.04 ± 0.94
Fixed:	
Arrows	25.50
Binoculars	21.59
Camping equipment	15.06
Clothing	31.90
Weapons	39.80
Miscellaneous	10.20
Vehicles	453.58
Season	597.63 ± 153.43
Daily	57.60 ± 16.26
Total fixed & variable:	
Season	748.39 ± 160.54
Daily	70.17 ± 16.56

[a]Indicates a 90 percent confidence interval (alpha = 0.1). There is a 90 percent probability that the true population mean is contained within the confidence interval.

TABLE 15. ARCHERY DEER HUNTING EXPENDITURES BY RESIDENT HUNTERS FOR 1982 AND 1986 EXPRESSED IN 1986 DOLLARS

Expenditures	1982	1986	Significant Differences[a]
Variable:			
Season	$127.89 ± 29.28[b] (n=83)	$141.62 ± 16.82 (n=630)	No
Daily	$ 13.95 ± 3.62 (n=83)	$ 13.04 ± 0.94 (n=608)	No
Fixed:			
Season	$80.35 ± 16.05 (n=66)	$597.63 ± 153.43 (n=600)	Yes
Daily	$ 9.39 ± 3.19 (n=64)	$ 57.60 ± 16.26 (n=578)	Yes
Total:			
Season	$233.36 ± 42.71 (n=63)	$748.39 ± 160.54 (n=586)	Yes
Daily	$ 24.38 ± 10.37 (n=63)	$ 70.17 ± 16.56 (n=564)	Yes

[a]Significant at a 90 percent confidence level (alpha = 0.1).
[b]There is a 90 percent probability that the true population mean is contained within the confidence interval.

TABLE 16. REPORTED DEER HARVESTED AND ARCHERY DEER HUNTER SUCCESS RATE, 1986

Item	Number[a]	Percent
Mule Deer:		
Large Buck	17	7.4
Small Buck	1	0.4
Large Doe	2	0.9
Small Doe	0	0.0
Total	20	8.7
Whitetail Deer:		
Large Buck	106	46.3
Small Buck	26	11.4
Large Doe	50	21.8
Small Doe	27	11.8
Total	209	91.3
Total harvested	229	100.0
Total hunters	683	
Success rate	-	33.5

[a]Number represents survey responses.

Wild Turkey

North Dakota residents received 2,126 wild turkey licenses through a lottery in 1986. A list of 2,105 names was selected by the Game and Fish Department and mailed postseason questionnaires. Questionnaires returned numbered 1,631 with 198 residents not hunting, 1,427 hunting, and 4 not reporting. Survey response rate after two mailings was 77 percent.

Characteristics

Wild turkey hunter questionnaires were divided into three groups: early, late, and gratis (landowners). Gratis, early, and late hunters responding hunted an average of 2.8, 1.8, and 2.2 days, respectively. The entire group hunted 2.1 days on average. Average distance traveled by the entire group was 232 miles. Residents scouting turkeys in the preseason were 455 (32 percent). Of those returning surveys, 779 (48 percent) had hunted turkeys previously and 803 (52 percent) had not. Residents responding valued a day of turkey hunting at $173 on average. Seven hunters valued a day of hunting as priceless.

Expenditures

Expenditures by hunter license type show that gratis hunters spent less on variable and fixed seasonal goods when compared to either early- or late-season hunters (Table 17). Early- and late-season hunters had nearly the same seasonal average expenditures on variable goods and services. Expenditures on fixed inputs were considerably higher for early turkey hunters due to a higher reported average expense for vehicles used during the hunting season. Average total seasonal expenditures were highest for early turkey hunters followed by late and gratis hunters. Average seasonal expenditures for the entire group were $48.81, $439.58, and $488.73 for variable, fixed, and total expenditures, respectively. Total projected expenditure by all resident wild turkey hunters was $913,000 for the 1986 season.

Because expenditure patterns between seasons and license types are considerably different, future surveys should continue to separate results by license type (resident vs. gratis) as well as hunting season (early vs. late).

Comparing average seasonal expenditure patterns from the 1982 hunting season with 1986 indicates that the average variable seasonal expenditure has dropped significantly while spending on fixed seasonal goods has increased significantly (Table 18). Average total seasonal expenditure has also increased significantly. This implies that a lower seasonal variable expenditure has been offset by a significant increase in the fixed seasonal expenditure.

The average daily variable expenditure has decreased significantly since 1982. However, daily fixed and total expenditures have increased significantly.

Harvest

Resident hunters responding harvested 1,023 turkeys, for a success rate of 72 percent (Table 19). Harvest was 49 percent gobblers, 44 percent hens, and 7 percent unknown.

TABLE 17. WILD TURKEY HUNTER EXPENDITURES, 1986

Expenditure Categories	License Type			All
	Gratis	Early-Season	Late-Season	
	dollars			
Variable:				
Access fees	0.00	0.13	0.29	0.21
Film	0.60	1.31	1.00	1.10
Food & beverages	4.07	14.98	13.75	13.77
Lodging	0.00	3.38	2.41	2.69
Other	0.00	0.73	0.49	0.56
Taxidermy	0.22	1.88	2.20	1.97
Transportation	11.92	26.20	24.15	24.39
Ammunition	2.40	4.19	4.23	4.12
Season	18.87 ± 6.84[a]	52.53 ± 3.23	47.98 ± 3.43	48.81 ± 2.34
Daily	9.10 ± 4.01	36.53 ± 2.59	27.47 ± 2.06	30.58 ± 1.59
Fixed:				
Binoculars	3.75	5.90	6.08	5.91
Camping equip.	1.37	9.18	0.48	4.08
Clothing	4.70	8.93	5.81	7.05
Weapons	2.50	19.19	23.05	22.06
Miscellaneous	2.50	4.19	0.68	2.18
Vehicles	0.00	659.53	217.95	398.28
Season	14.82 ± 11.22	706.92 ± 237.84	253.67 ± 34.28	439.58 ± 110.05
Daily	6.79 ± 5.70	608.38 ± 221.11	152.50 ± 57.42	341.41 ± 98.16
Total (fixed & variable):				
Season	32.99 ± 13.98	738.04 ± 231.41	298.18 ± 86.64	488.73 ± 110.40
Daily	15.57 ± 6.81	626.32 ± 215.21	177.86 ± 57.01	372.11 ± 98.55

[a]Indicates a 90 percent confidence interval (alpha = 0.1). There is a 90 percent probability that the true population mean is contained within the confidence interval.

TABLE 18. WILD TURKEY HUNTING EXPENDITURES BY RESIDENT HUNTERS FOR 1981 AND 1986 EXPRESSED IN 1986 DOLLARS

Expenditures	1981[a]			1986			Significant Differences[b]
Variable:							
Season	$72.01 ±	10.74[c]	(n=198)	$48.81 ±	2.34	(n=1,194)	Yes
Daily	$46.43 ±	8.52	(n=198)	$30.58 ±	1.59	(n=1,176)	Yes
Fixed:							
Season	$200.34 ±	86.84	(n=192)	$439.58 ±	110.05	(n=1,169)	Yes
Daily	$123.36 ±	50.94	(n=192)	$341.41 ±	98.16	(n=1,150)	Yes
Total:							
Season	$273.24 ±	89.77	(n=192)	$488.73 ±	110.40	(n=1,169)	Yes
Daily	$170.15 ±	55.72	(n=192)	$372.11 ±	98.55	(n=1,150)	Yes

[a]1981 data were used because the 1982 early and late seasons were not aggregated.
[b]Significant at a 90 percent confidence level (apha = 0.1).
[c]There is a 90 percent probability that the true population mean is contained within the confidence interval.

TABLE 19. REPORTED WILD TURKEYS HARVESTED AND WILD TURKEY HUNTER SUCCESS RATE, 1986

Item	Number[a]	Percent
Gobbler	504	49.3
Hen	451	44.1
Unknown	68	6.6
Total harvested	1,023	100.0
Total hunters	1,427[b]	
Success rate	-	71.7

[a]Number represents survey responses.
[b]Fifteen (15) respondents said they hunted, but did not answer questions on whether they harvested a wild turkey.

Summer Fishing

Residents purchased 143,751 North Dakota fishing licenses in 1986. Since these names were not available, a random sample of 2,500 names was chosen from 1985 license buyers and mailed a postseason questionnaire; 1,768 questionnaires were returned. Returns indicated that 1,016 residents fished and 152 did not. Survey response rate was 68 percent after three mailings.

Characteristics

The majority of licenses purchased by respondents was husband and wife (61 percent) followed by individual (29 percent) and senior citizen (10 percent). The principal angler was the husband by himself 51 percent of the time, both husband and wife 47 percent of the time, and the wife by herself 2 percent of the time. Average days spent fishing were eight with both husband and wife fishing together, eight with only the husband fishing, and one with only the wife fishing. Average days spent fishing by all license types was 13. The average number of family members who fished was three with an average of one family member being under age 16. Summer anglers who responded indicated that 38 percent never ice fish, 48 percent ice fish occasionally, and 14 percent ice fish often. Average distance traveled by respondents was 649 miles. The average value of a day of fishing reported was $302. Two North Dakota residents indicated that a day of fishing was priceless.

Table 20 presents a listing of preference ratings by fish species. Results indicated that walleye was the most popular game fish followed by northern pike. The least popular fish was the paddlefish.

TABLE 20. SUMMER FISHING PREFERENCES REPORTED BY RESIDENTS, 1986

Fish	Rank					
	#1	#2	#3	#4	#5-#11	Yes[a]
Northern Pike	115	372	176	49	23	69
Walleye	673	128	40	11	76	6
Trout	21	39	58	47	83	6
Perch	36	160	149	67	55	31
Catfish	11	25	27	21	72	7
Bullhead	8	12	8	19	80	10
Salmon	15	68	44	35	68	8
Sunfish	17	36	63	75	72	11
Bass	12	32	49	50	88	11
Anything	64	33	91	88	134	62
Paddlefish	2	10	10	11	65	2

[a]Represents people who indicated the fish as a preference but did not rank it specifically.

Expenditures

Survey results indicated that 79 percent and 21 percent of the money spent during the fishing season was spent by the husband and wife, respectively. Average variable seasonal expenditure was $316.25. Average fixed seasonal expenditure was $959.44 for an average total expenditure of $1,268.80 for the entire fishing season (Table 21). Total projected expenditure by resident summer anglers was $158,681,000. No attempt was made to account for nonlicensed anglers, primarily those under age 16 who fish with licensed parents or who fish but whose parents do not.

TABLE 21. SUMMER FISHING EXPENDITURES BY RESIDENT ANGLERS, 1986

Expenditure Category	Mean
	-----dollars-----
Variable:	
Access fees	3.01
Bait	23.99
Film	4.54
Food and beverages	80.29
Lodging	19.77
Meat processing	1.52
Other	8.49
Taxidermy	5.10
Transportation	104.02
Boat gas	35.99
Boat launching	2.46
Boat maintenance	25.03
Boat rental	2.66
Season	316.25 ± 30.90[a]
Daily	28.76 ± 3.32
Fixed:	
Boat	338.06
Camping equipment	38.22
Clothing	9.47
Depth finder	18.89
Miscellaneous	12.65
Rods	34.18
Tackle	30.56
Vehicles	479.62
Season	959.44 ± 172.05
Daily	107.57 ± 36.19
Total fixed & variable:	
Season	1,268.80 ± 181.67
Daily	126.66 ± 32.88

[a]Indicates a 90 percent confidence interval (alpha = 0.1). There is a 90 percent probability that the true population mean is contained within the confidence interval.

Variable seasonal and daily expenditures have not changed significantly since 1982 (Table 22). However, both fixed and total seasonal and daily expenditures have significantly increased.

TABLE 22. SUMMER FISHING EXPENDITURES BY RESIDENT ANGLERS FOR 1982 AND 1986 EXPRESSED IN 1986 DOLLARS

Expenditures	1982[a]	1986	Significant Differences[b]
Variable:			
Season	$371.05 ± 108.45[c] (n=34)	$316.25 ± 30.90 (n=962)	No
Daily	$ 26.35 ± 5.45 (n=34)	$ 28.76 ± 3.32 (n=892)	No
Fixed:			
Season	$404.03 ± 267.35 (n=31)	$959.44 ± 172.05 (n=971)	Yes
Daily	$ 28.81 ± 17.17 (n=31)	$107.57 ± 36.19 (n=902)	Yes
Total:			
Season	$797.89 ± 357.12 (n=31)	$1,268.80 ± 181.67 (n=959)	Yes
Daily	$ 53.98 ± 19.64 (n=31)	$126.66 ± 32.88 (n=890)	Yes

[a]Taken from monthly survey data (Kerestes and Leitch 1983b).
[b]Significant at a 90 percent confidence level (alpha = 0.1).
[c]There is a 90 percent probability that the true population mean is contained within the confidence interval.

Winter Fishing

A separate license is not required for ice fishing, allowing people who purchase a license in the summer to fish in the winter. Although some people may only fish in the winter, there is no easy way to identify them. Therefore, a list of names was selected from questionnaires returned from the summer fishing survey. The summer fishing questionnaire asked if they ice fish frequently, occasionally, or never. Respondents answering either frequently or occasionally were mailed a winter fishing questionnaire. Questionnaires were mailed to 612 winter anglers with 484 returned after two mailings. Survey response rate was 79 percent.

Characteristics

The average resident winter angler responding fished 12 days. Average days spent fishing by the husband was 10. The wife fished by herself 0.2 days. Husband and wife spent four days on average fishing together. The average resident winter angler traveled 651 miles during the season. The average number in the family who fished was two, with 0.6 family members under age 16. The average value of a day of ice fishing was

$30. One individual valued a day of ice fishing at $1,000,000. (This response was not included in the average value of a day.) Six residents valued a day of ice fishing as priceless.

A preference rating scale is provided in Table 23. Results indicate that walleye was the most popular fish followed by perch and northern pike. The least popular fish among winter anglers was the bullhead.

TABLE 23. WINTER FISHING PREFERENCES REPORTED BY RESIDENTS, 1986

Fish	Rank					
	#1	#2	#3	#4	#5-#11	Yes[a]
Northern Pike	25	54	55	15	4	7
Walleye	119	43	14	1	0	9
Trout	2	6	9	6	7	2
Perch	37	73	35	12	5	8
Catfish	0	0	1	0	16	2
Bullhead	0	0	0	0	15	3
Salmon	0	0	6	2	2	13
Bluegill/Crappie	1	7	9	12	5	13
Bass	0	1	1	2	2	18
Anything	7	2	14	29	8	24

[a]Represents people who indicated the fish as a preference but did not rank it specifically.

Expenditures

The average resident winter angler responding spent $180.97, $79.83, and $272.67 on variable, fixed, and total goods, respectively, during the 1986 season (Table 24). Average daily variable, fixed, and total seasonal expenditures reported were $23.38, $9.46, and $33.32, respectively. Total projected expenditure by resident winter anglers was $8,998,000.

Winter anglers spent considerably less than summer anglers. One reason for a lower average total seasonal expenditure by winter anglers is the lack of vehicle expenses reported by the group.

TABLE 24. WINTER FISHING EXPENDITURES BY RESIDENT ANGLERS, 1986

Expenditure Category	Mean
	----dollars----
Variable:	
Bait	14.06
Film	1.25
Food and beverages	52.82
Heating gas	6.52
House rental	1.57
Lodging	4.52
Meat processing	2.30
Other	1.09
Repairs	11.52
Taxidermy	4.46
Transportation	81.19
Season	180.97 ± 32.99[a]
Daily	23.38 ± 4.63
Fixed:	
Auger	22.14
Clothing	14.13
Fish finder	7.60
Fish house	13.34
Miscellaneous	1.08
Rods	9.54
Tackle	13.00
Vehicles	0.00
Season	79.83 ± 19.68
Daily	9.46 ± 2.30
Total fixed & variable:	
Season	272.67 ± 48.89
Daily	33.32 ± 5.97

[a]Indicates a 90 percent confidence interval (alpha = 0.1). There is a 90 percent probability that the true population mean is contained within the confidence interval.

Small Game

North Dakota residents purchased 65,987 small game licenses in 1986. However, since these names were not available, Game and Fish supplied 2,000 names of 1985 license buyers who were mailed a postseason questionnaire. Questionnaires returned numbered 1,284 after two mailings. Survey response rate was 62 percent.

Characteristics

Small game hunting was divided into upland game and waterfowl. The average resident upland game hunter responding traveled 521 miles and hunted nine days. The average resident waterfowl hunter traveled 480 miles and hunted eight days. Upland game hunters responding valued a day of hunting at $66 with one individual indicating a day of hunting was priceless. Resident waterfowl hunters responding valued a day of hunting at $60 with one person responding a day of hunting was priceless.

Expenditures

The average respondent to the North Dakota upland game hunter survey spent $162.08 and $674.22 on variable and fixed goods, respectively, during the hunting season for an average total seasonal expenditure of $844.47 (Table 25). Projected total seasonal expenditure by all upland game hunters was $44,712,000. The average resident waterfowl hunter spent $598.34 during the hunting season divided $163.25 for variable goods and $424.34 for fixed inputs (Table 26). Total projected seasonal expenditure by all resident waterfowl hunters was $21,868,000.

Resident upland game hunter spending increased significantly in 1986 compared to 1982 (Table 27). Spending increased significantly for both variable and fixed goods during the season and on a daily basis for higher average total seasonal and daily expenditures. Spending by resident waterfowl hunters increased significantly for variable, fixed, and total expenditures for both seasonal and daily average expenditures (Table 28).

TABLE 25. UPLAND GAME HUNTER EXPENDITURES, 1986

Expenditure Category	Mean
	----dollars----
Variable:	
Access fees	0.39
Ammunition	27.59
Film	1.90
Food and beverages	38.27
Lodging	9.81
Other	2.37
Taxidermy	3.64
Transportation	72.58
Veterinarian	5.80
Season	162.08 ± 12.87[a]
Daily	22.59 ± 1.62
Fixed:	
Camping equipment	25.95
Clothing	29.66
Dog	14.48
Weapons	60.93
Miscellaneous	6.64
Vehicles	537.55
Season	674.22 ± 180.27
Daily	156.37 ± 68.22
Total fixed & variable:	
Season	844.47 ± 182.91
Daily	179.63 ± 68.60

[a]Indicates a 90 percent confidence interval (alpha = 0.1). There is a 90 percent probability that the true population mean is contained within the confidence interval.

TABLE 26. WATERFOWL HUNTER EXPENDITURES, 1986

Expenditure Category	Mean
	----dollars----
Variable:	
Access fees	0.55
Ammunition	34.47
Film	1.75
Food and beverages	38.01
Lodging	5.73
Other	1.77
Taxidermy	2.95
Transportation	74.09
Boat rental	1.71
Veterinarian	2.28
Season	163.25 ± 13.87[a]
Daily	23.53 ± 1.61
Fixed:	
Camping equipment	2.57
Clothing	28.25
Dog	3.99
Weapons	29.21
Miscellaneous	7.44
Vehicles	336.71
Decoy	2.52
Boat	14.73
Season	424.34 ± 164.40
Daily	63.00 ± 33.12
Total fixed & variable:	
Season	598.34 ± 166.21
Daily	86.88 ± 33.21

[a]Indicates a 90 percent confidence interval (alpha = 0.1). There is a 90 percent probability that the true population mean is contained within the confidence interval.

TABLE 27. UPLAND GAME HUNTING EXPENDITURES BY RESIDENT HUNTERS FOR 1982 AND 1986 EXPRESSED IN 1986 DOLLARS

Expenditures	1982		1986		Significant Differences[a]
Variable:					
Season	$103.31 ± 10.73[b]	(n=502)	$162.08 ± 12.87	(n=744)	Yes
Daily	$ 16.38 ± 1.73	(n=496)	$ 22.59 ± 1.62	(n=734)	Yes
Fixed:					
Season	$ 91.92 ± 23.51	(n=169)	$674.22 ± 180.27	(n=676)	Yes
Daily	$ 16.19 ± 5.33	(n=167)	$156.37 ± 68.22	(n=667)	Yes
Total:					
Season	$177.18 ± 32.34	(n=169)	$844.47 ± 182.91	(n=676)	Yes
Daily	$ 32.80 ± 7.62	(n=167)	$179.63 ± 68.60	(n=667)	Yes

[a]Significant at a 90 percent confidence level (alpha = 0.1).
[b]There is a 90 percent probability that the true population mean is contained within the confidence interval.

TABLE 28. WATERFOWL HUNTING EXPENDITURES BY RESIDENT HUNTERS FOR 1982 AND 1986 EXPRESSED IN 1986 DOLLARS

Expenditures	1982		1986		Significant Differences[a]
Variable:					
Season	$113.60 ± 12.17[b]	(n=464)	$163.25 ± 13.87	(n=503)	Yes
Daily	$ 17.46 ± 1.65	(n=456)	$ 23.53 ± 1.61	(n=500)	Yes
Fixed:					
Season	$ 87.89 ± 20.36	(n=465)	$424.34 ± 164.40	(n=440)	Yes
Daily	$ 16.23 ± 4.32	(n=457)	$ 63.00 ± 33.12	(n=438)	Yes
Total:					
Season	$201.43 ± 26.17	(n=464)	$598.34 ± 166.21	(n=440)	Yes
Daily	$ 33.59 ± 4.98	(n=456)	$ 86.88 ± 33.21	(n=438)	Yes

[a]Significant at a 90 percent confidence level (alpha = 0.1).
[b]There is a 90 percent probability that the true population mean is contained within the confidence interval.

Furbearer

North Dakota Game and Fish sold 34,781 resident furbearer licenses for the 1986-87 season. Names were not available so the 1985-86 license buyers were used to select 5,728 names, who were mailed postseason questionnaires by the Game and Fish Department. Questionnaires returned numbered 3,301. Response rate was 46 percent after one mailing.

Characteristics

The average furbearer hunter/trapper responding traveled 636 miles during the season. Furbearer hunters/trappers valued a day of hunting and/or trapping at $41 with 37 respondents indicating that a day was priceless.

Expenditures

Resident furbearer hunters/trappers responding had average seasonal expenditures of $142.60 and $480.24 for variable and fixed goods, respectively, for an average total seasonal expenditure of $646.32 (Table 29). Total projected expenditure by resident furbearer hunters/trappers was $17,921,000.

The average variable seasonal expenditure was significantly lower in 1986 when compared with 1982 (Table 30). Fixed and total seasonal expenditures were not significantly different.

Special Big Game

Special big game hunting includes moose, elk, and bighorn sheep. Hunters from all three groups were combined because of the relatively small number of hunters within each group. Post-season questionnaires were mailed to 152 residents based on 1986 licenses purchased. Response rate was 72 percent.

Characteristics

The average resident big game hunter responding traveled 583 miles and hunted 3.8 days. Preseason scouting was done by 87 (85 percent) of the residents responding. Twenty percent of the respondents thought the price of a big game license was low, and 80 percent thought the price was fair. (This may be somewhat misleading since only six individuals responded to the question.) The value of a day of big game hunting was $235.

TABLE 29. FURBEARER HUNTING/TRAPPING EXPENDITURES, 1986

Expenditure Category	Mean
	----dollars----
Variable:	
Access fees	0.35
Ammunition	19.07
Film	1.78
Food and beverages	26.97
Lodging	3.04
Other	2.41
Taxidermy	3.43
Transportation	85.55
Season	142.60 ± 10.52[a]
Fixed:	
ATV	48.85
Binoculars	19.59
Calls	5.55
Camping equipment	1.92
Clothing	20.70
Weapons	76.31
Miscellaneous	1.55
Skinning equipment	3.62
Snow shoes	5.06
Traps	20.44
Vehicles	325.24
Season	480.24 ± 115.28
Total fixed & variable:	
Season	646.32 ± 122.44

[a]Indicates a 90 percent confidence interval (alpha = 0.1). There is a 90 percent probability that the true population mean is contained within the confidence interval.

TABLE 30. FURBEARER HUNTING/TRAPPING EXPENDITURES BY RESIDENTS FOR 1982 AND 1986 EXPRESSED IN 1986 DOLLARS

Expenditures	1982	1986	Significant Differences[a]
Variable:			
Season	$199.33 ± 30.67[b] (n=210)	$142.60 ± 10.52 (n=962)	Yes
Fixed:			
Season	$403.52 ± 176.83 (n=178)	$480.24 ± 115.28 (n=776)	No
Total:			
Season	$623.54 ± 185.57 (n=178)	$646.32 ± 122.44 (n=759)	No

[a]Significant at a 90 percent confidence level (alpha = 0.1).
[b]There is a 90 percent probability that the true population mean is contained within the confidence interval.

Expenditures

Resident special big game hunters responding spent $409.26 and $1,079.39 on variable and fixed goods, respectively, during the season for an average total seasonal expenditure of $1,504.63 (Table 31). Total projected seasonal expenditure by all resident special big game hunters was $229,000.

Comparing 1986 expenditures with those in 1982 indicates that the average variable seasonal expenditure in 1986 has declined significantly (Table 32). Average fixed and total seasonal expenditures have increased significantly since 1982.

The average daily variable expenditure shows no significant change. However, average daily fixed and total expenditures have increased significantly since 1982.

Harvest

Special big game harvested by residents were 21 elk, 70 moose, and 5 bighorn sheep (ram) (Table 33). Elk hunters' success rate was 72 percent, and moose hunters' success rate was 92 percent.

TABLE 31. SPECIAL BIG GAME (MOOSE, ELK, BIGHORN SHEEP) HUNTER EXPENDITURES, 1986

Expenditure Category	Mean
	-----dollars-----
Variable Cost:	
Access fees	2.50
Ammunition	21.05
Film	11.21
Food and beverages	67.20
Lodging	28.47
Meat processing	80.68
Motel	55.21
Taxidermy	110.97
Transportation	75.86
Other	4.74
Season	409.26 ± 47.80[a]
Daily	178.96 ± 28.87
Fixed cost:	
Arrows	3.09
Bows	12.79
Camping equipment	16.01
Clothing	23.94
Gun	159.95
Vehicles	904.23
Miscellaneous	19.10
Season	1,079.39 ± 628.35
Daily	661.54 ± 490.64
Total fixed & variable:	
Season	1,504.63 ± 635.33
Daily	846.23 ± 502.02

[a]Indicates a 90 percent confidence interval (alpha = 0.1). There is a 90 percent probability that the true population mean is contained within the confidence interval.

TABLE 32. SPECIAL BIG GAME (MOOSE, ELK, BIGHORN SHEEP) HUNTING EXPENDITURES BY RESIDENT HUNTERS FOR 1982 AND 1986 EXPRESSED IN 1986 DOLLARS

Expenditures	1982	1986	Significant Differences[a]
Variable:			
Season	$634.53 ± 143.55[b] (n=17)	$409.26 ± 47.80 (n=108)	Yes
Daily	$247.51 ± 112.09 (n=17)	$178.96 ± 28.87 (n=108)	No
Fixed:			
Season	$153.01 ± 158.25 (n=17)	$1,079.39 ± 628.35 (n=83)	Yes
Daily	$ 79.44 ± 84.28 (n=17)	$661.54 ± 490.64 (n=83)	Yes
Total:			
Season	$787.54 ± 260.46 (n=17)	$1,504.63 ± 635.33 (n=83)	Yes
Daily	$326.94 ± 176.78 (n=17)	$846.23 ± 502.02 (n=83)	Yes

[a]Significant at a 90 percent confidence level (alpha = 0.1).
[b]There is a 90 percent probability that the true population mean is contained within the confidence interval.

TABLE 33. SPECIAL BIG GAME (ELK AND MOOSE) HARVESTED AND HUNTER SUCCESS RATE, 1986

Species/Sex	Number[a]	Percent
Elk:		
Female calf	1	5
Male calf	0	0
Cows	6	28
Bulls	14	67
Total	21	100
Hunters' success rate	29	72
Moose:		
Female calf	0	0
Male calf	1	2
Cows	22	31
Bulls	47	67
Total	70	100
Hunters' success rate	76	92

[a]Number represents survey responses.

Economic Impact

Resident sportsmen spent an estimated $310 million (excluding the cost of licenses) in North Dakota in 1986 (Table 34). Sportsmen expenditures generate $1.25 in gross business volume in addition to the $1 spent, for a multiplier of 2.25. (This assumes that 25 percent and 75 percent of total hunting and fishing expenditures occur in the business and personal service and retail trade sectors, respectively.) Each $1 spent generates $0.48 in personal income and every $82,400 spent by sportsmen supports one job (Coon and Leistritz 1987).

Hunters' and anglers' expenditures accounted for $698 million in gross business volume, $149 million in personal income, and 8,470 jobs in North Dakota in 1986. Resident hunters and anglers thus generate 3 percent of the gross state product, 2 percent of state personal income, and 3 percent of state employment with little or no investment because these returns stem primarily from the state's natural resource base.

Summary

Special big game hunters spent more per day ($846) and had the highest total seasonal expenditures ($1,505) on average when compared with the other sportsmen activities (Table 34). Winter anglers spent the least per day ($33) and had the lowest average total seasonal expenditures ($273).

Total projected expenditures were highest for summer fishing, with an estimated $158,681,000 being spent by North Dakota anglers during the 1986 fishing season. Total projected expenditure by residents for all activities surveyed was $309,628,000 (not including the cost of licenses) for the 1986 season.

Summer fishing anglers also had the highest average value of a day ($302), while winter fishing anglers had the lowest average value of a day ($30).

Sportsmen expenditures generated $698 million in gross business volume, $149 million in personal income, and 8,470 jobs in North Dakota. Hunters and anglers accounted for 3 percent of the gross state product, 2 percent of state personal income, and 3 percent of state employment in 1986.

TABLE 34. SUMMARY OF EXPENDITURES, VALUE OF A DAY, AND TOTAL PROJECTED EXPENDITURES FOR EACH SPORTSMEN ACTIVITY, 1986

Activity	Average Total Expenditures Per Sportsmen		Average Value of A Day	Total Projected Expenditures
	Daily	Season		
	----------dollars----------			
Firearms antelope	499	606	N/A	348,000
Archery antelope	248	1,161	45	783,000
Firearms deer	211	597	48	48,135,000
Archery deer	70	748	39	7,040,000
Turkey	372	489	173	913,000
Small game:				
Upland game	180	844	66	44,712,000
Waterfowl	87	598	60	21,868,000
Furbearer	N/A	646	41	17,921,000
Special big game	846	1,505	235	229,000
Hunting subtotal	-	-	-	141,949,000
Fishing:				
Summer	127	1,269	302	158,681,000
Winter	33	273	30	8,998,000
Fishing subtotal	-	-	-	167,679,000
Cost of licenses	-	-	-	3,452,000
Total hunting and fishing expenditures	-	-	-	313,080,000

Conclusions

Average seasonal variable expenditures were generally significantly lower in 1986 than adjusted 1982 estimates. Lower transportation, ammunition, and food and/or lodging expenses were the major items contributing to significantly lower average seasonal variable expenditures. Average fixed expenditures for the 1986 season were significantly higher than 1982 adjusted figures. Higher vehicle, clothing, camping equipment, and/or weapons expenditures contributed to this difference. Increased average fixed expenditures more than offset decreased average variable expenditures and resulted in higher average total seasonal expenditures for most activities.

There were a few activity groups that did not follow this general pattern. Archery antelope, firearms deer, upland game, and waterfowl hunters in 1986 reported significantly higher average variable expenditures. The sample for the 1986 archery antelope group was taken from the 1985 license-buying population. Therefore, the sample may be biased toward more experienced hunters because first-time license buyers and those not buying a license each year would be underrepresented. The 1982 survey used names of current license buyers. Higher variable costs reported by the 1986 archery antelope hunters could be a reflection of a more dedicated or serious group. A significant increase in the days hunted on average, from 4.9 in 1982 to 7.3 in 1986, could be due to a more serious group of hunters, weather during the season, or other factors. The 1986 archery deer hunters' average variable expenditure was not significantly different than 1982, but tended to be higher, indicating possible bias in this group as well, albeit to a lesser degree.

A similar, but almost reverse, situation may explain the departure of firearms deer hunters from the general pattern. The 1982 sample was taken entirely from the Sheyenne-James unit. Reduced transportation and food and lodging costs associated with more localized hunting probably reflected lower variable expenditure estimates. Expenditures were significantly less than the estimates for a statewide sample of 1981 firearms deer hunters. When the 1986 seasonal average variable expenditures are compared with adjusted 1981 estimates, they are significantly lower and thus follow the general pattern of other groups.

The 1982 surveys of upland game and waterfowl hunters did not itemize expenditure categories, and estimates were significantly lower than figures reported for 1981. Here again, if the 1986 data are compared to the adjusted 1981 estimates, these two groups follow the same general pattern as all other groups. (Average daily expenditure estimates generally reflect this same pattern of reduced variable and higher fixed expenditures.) Deviations can generally be explained by changes in reported average number of days participated from 1982 to 1986.

A large share of the increase in 1986 fixed expenditures can be attributed to higher reported vehicle expenditures. Therefore, comparisons with 1982 estimates for some groups should be made cautiously. Upland game and waterfowl expenditures were not itemized, and turkey hunters' expenditures for vehicles were not included in the itemized list. Slightly different wording between years on special big game surveys may have partially contributed to the higher vehicle expenditures in 1986.

Furbearer and firearms antelope samples did not have an increase in the proportion of survey respondents reporting expenditures for vehicles. Average seasonal fixed expenditures were higher, but not significantly higher. Archery hunters and firearms deer hunters had at least a doubling of the proportion of respondents who reported vehicle expenditures. The same proportion of fishermen reported vehicle expenditures in both years; however, the 1982 survey group was very small and the survey technique was different.

Allocation of vehicle costs to hunting and/or fishing is difficult and subject to various interpretations. Although a pattern is not clear, it appears that sportsmen spent more on durable equipment and more sportsmen were spending more.

Sportsmen generally experienced better field conditions in 1986 than in 1982. There was a reduction in the average number of days sportsmen participated, and success per effort was higher for most groups. A combination of these two factors might have resulted in reduced average variable expenditures. Sportsmen spent less time hunting and traveled less to achieve the same success. Reduced average variable costs may have contributed to the purchase of more durable items.

Another factor contributing to higher average fixed expenditures was higher disposable income in 1986. Disposable income earned by residents increased 28 percent from 1982 to 1986 while inflation increased only 13 percent, leaving a 15 percent increase in real income (U.S. Department of Commerce 1986).

Future surveys of expenditures should include samples of both gratis and resident license types because expenditure patterns between the two groups are different. Separating hunter expenditures by license type will provide a more accurate measure of expenditures for a particular hunting activity. Including gratis and resident responses in one group could over/under estimate expenditures. More accurate expenditure estimates would improve the estimated impacts of hunter expenditures on the North Dakota economy.

Rural North Dakota supplies most of the amenity resource inputs that contribute to hunting and fishing activities. Wildlife habitat, fishing waters, and the fish and wildlife resources are each elements of the state's rural environment. A substantial portion of the $310 million spent by sportsmen in the state in 1986 was spent in rural areas, generating business activity and supporting employment in areas with few job alternatives. Sportsmen's dollars are spent in communities where a few more meals sold and a few more fill-ups at the service station each day during the hunting season can markedly affect small, service-oriented businesses.

Hunting and fishing contribute not only to the economic well-being of North Dakota but also to the general welfare of its residents, all without the negative effects of smokestacks or competing with other industries. The opportunity to hunt and fish is a personal intangible adding to the quality of life. In the search for a match between North Dakota's rural communities and commercial or industrial development, the availability of hunting and fishing is a positive factor.

Rural leaders should look seriously at the potential for increasing hunting and fishing activities in their jurisdictions. It appears to offer large returns to small, rural communities, with little investment in a business environment with few viable alternatives.

References

Anderson, Randall S., and Jay A. Leitch. 1984. Characteristics and Expenditures of Nonresident Sportsmen in North Dakota in 1983. Agr. Econ. Rpt. No. 77. Fargo: North Dakota State University, Agr. Experiment Station.

Baltezore, James F., and Jay A. Leitch. 1987. Resident Hunter and Angler Expenditures and Characteristics in North Dakota in 1986. Staff Paper Series AE 87008. Fargo: North Dakota State University, Agr. Experiment Station, Dept. of Agr. Econ.

Coon, Randal C., and F. Larry Leistritz. 1987. The North Dakota Economy: Estimating Recent Changes and Projecting Future Trends in the Economic Base. Agr. Econ. Stat. Series No. 41. Fargo: North Dakota State University, Dept. of Agr. Econ.

Coon, Randal C., F. Larry Leistritz, Thor A. Hertsgaard, and Arlen G. Leholm. 1985. The North Dakota Input-Output Model: A Tool for Analyzing Economic Linkages. Agr. Econ. Rpt. No. 187. Fargo: North Dakota State University, Dept. of Agr. Econ.

Kerestes, Daniel E., and Jay A. Leitch. 1983a. An Analysis of Sportsman Data Activity Collection Methods for North Dakota. Agr. Econ. Rpt. No. 180. Fargo: North Dakota State University, Agr. Experiment Station.

Kerestes, Daniel E., and Jay A. Leitch. 1983b. Development and Implementation of a Periodic Data Collection System for Game and Fish Management and Policy Analysis: Second Annual Report. Fargo: North Dakota State University, Agr. Experiment Station.

Leitch, Jay A. 1984. "Leisure Time Industries." North Dakota Farm Research 42(1):45-47.

Leitch, Jay A., and Daniel E. Kerestes. 1982. Development and Implementation of a Periodic Data Collection System for Game and Fish Management and Policy Analysis. Fargo: North Dakota State University, Agr. Experiment Station.

Leitch Jay A., and Donald F. Scott. 1978. Nonresident Hunters in North Dakota: Characteristics, Expenditures, Harvest. Agr. Econ. Rpt. No. 126. Fargo: North Dakota State University, North Dakota Agricultural Experiment Station and Dept. of Agr. Econ.

U.S. Department of Commerce. September 1986. Survey of Current Business, Vol. 66, No. 9, Bureau of Economic Analysis, Washington, D.C.: U.S. Government Printing Office.

U.S. Department of the Interior and U.S. Department of Commerce. 1982. 1980 National Survey of Fishing, Hunting, and Wildlife - Associated Recreation. Fish and Wildlife Service and Bureau of the Census. Washington, D.C.: U.S. Government Printing Office.

APPENDIX A

TABLE A1. FUTURE SAMPLE SIZES TO ESTIMATE CONFIDENCE INTERVALS ± 10 PERCENT OF THE MEAN FOR SELECTED VARIABLES

Activity[a]	Significance Level 80	90	95
Firearms Antelope			
Seasonal variable expenditures	145	240	340
Daily variable expenditures	190	310	440
Archery Antelope			
Seasonal variable expenditures	185	305	430
Daily variable expenditures	175	290	410
Firearms Deer			
Seasonal variable expenditures	175	285	405
Daily variable expenditures	245	405	575
Archery Deer			
Seasonal variable expenditures	540	890	1,265
Daily variable expenditures	195	320	450
Wild Turkey			
Seasonal variable expenditures	170	275	390
Daily variable expenditures	195	320	455
Upland Game			
Seasonal variable expenditures	285	470	670
Daily variable expenditures	230	380	540
Waterfowl			
Seasonal variable expenditures	225	365	520
Daily variable expenditures	145	235	335
Furbearer			
Seasonal variable expenditures	320	525	745
Summer Fishing			
Seasonal variable expenditures	560	920	1,305
Daily variable expenditures	725	1,190	1,690
Winter Fishing			
Seasonal variable expenditures	325	535	760
Daily variable expenditures	385	635	900
Special Big Game			
Seasonal variable expenditures	90	150	220
Daily variable expenditures	165	285	415

[a]Future sample sizes based on statistical variability (variance) in 1986 data sets.